

FORESTRY DEPARTMENT
The Pennsylvania State Colleges

1917
Forestry
Vol. XIV

THE HAWAIIAN FORESTER AND AGRICULTURIST

SEPTEMBER, 1917

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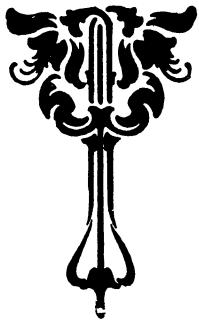
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The Hawaiian Forester and Agriculturist

A Monthly Magazine of Forestry,
Entomology, Animal Industry
and Agriculture.

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Board of Agriculture and Forestry

DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale, the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter, always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

PUBLICATIONS FOR DISTRIBUTION.

The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIV.

HONOLULU, SEPTEMBER, 1917.

No. 9

These Islands are usually blessed with beneficial rains which keep the earth watered and our waterpipes and tanks full. At such times there is very little or no menace to the forests by fire, but during a dry spell, such as we have experienced during the past few months, the danger to our native forests by the careless use of fire reappears and it behooves everyone who visits the foot-hills or mountains to take the most careful precautions against starting any fire on grass or forest lands. Fortunately during the present danger period there have been only a few fires, mostly in open grass lands, which have been promptly extinguished.

Action on Rule IV of the Division of Forestry, recently passed by the Board, by placing suitable signs on the small rock islands off the windward coast of Oahu and watching out for trespassers should do much to preserve the few remaining sea birds which nest on these island refuges and are a distinct addition to our Hawaiian fauna.

In the recent tree introductions into the Territory some of the species already show great promise, and it is confidently hoped that there will be a great many trees which will be a distinct addition to our island flora not only for timber production but also for water conservation purposes.

The fiscal year report of the different divisions, printed in this number, gives a resume of work done during the twelve months ended June 30, 1917, and the progress and activities up to that time.

The new plant inspection and quarantine building is being erected for the Board on Kekuanaoa street near the waterfront and when completed with the fumigation building will present facilities which will greatly assist the Division of Plant Inspection in rendering more efficient service in keeping insect pests out of the Territory.

The article by Chief Plant Inspector Ehrhorn on methods of fumigating stored products to prevent infestation, appearing in this number, will be of assistance to all food producers and dealers who have to face this problem.

The removal of the Farm dairy animals to new quarantine quarters and their detention for over 30 days without a further outbreak of anthrax and the thorough burning of the old dairy premises have cleared up the anthrax situation on Oahu so that now the people may rest easy. The situation on Maui has come to a satisfactory close and although there were a few deaths during August from anthrax on Kauai, where the infection was severe, the outbreak there may be considered at an end.

Remedies for Insects Infesting Stored Products

By E. M. EHRHORN,
Chief of Division of Plant Inspection.

The chief loss of grains, beans, and other products in stores, mills, grainbins or on the farm (especially products that have been stored for some time) is caused by insects, usually very minute beetles and their larvae, or the larvae of small moths. So sudden is the attack that one wonders how and from whence the pests appear.

In our semi-tropical climate much of the infestation begins in the field from the time of the ripening of the crop to its storage in bins or warehouses. The often heard remark that "beans are weevly" or "flour or cereal is wormy" are results of insect infestation, as quoted above.

Fortunately, the several important insects causing this infestation are amenable to like treatment.

Aside from various preventive considerations, such as the prompt hulling of corn and beans after harvesting, the thorough cleaning of the bins where old material has been stored before refilling them with the new crop, and the removal of all infested grain or meals from the building in which a new crop is to be stored, the principal remedy is fumigating all such stored products with carbon bisulphide immediately after the bins are filled; or, if the crop is to be stored in sacks, the whole output should be thoroughly fumigated before stored in the warehouse.

Another matter which is especially important to the small farmer is the practice of clean culture in his fields. Much of the weevly condition of bean crops is due to the neglect to remove and burn all trash left lying about the field and the accumulation of waste material along the edges of the field. The cleaning up of all such material will remove a lot of breeding places which hold the various pests until the new crops are ready to attract them.

The best and most lasting remedy, however, is fumigation with carbon bisulphide. This liquid is applicable only where its vapor or gas can be confined quite closely. The vapor is much heavier than air, and on account of this it is well adapted for fumigating seeds in tight bins, because the vapor descends into the bins

through the seed and rises as it drives the air out. It has also great penetrative power, and any products contained in bags, such as beans, rice, corn, flour and grains when infested, can be placed in tight compartments and fumigated successfully.

Carbon bisulphide is a very explosive liquid and can be placed on a par with gasoline. It is therefore very necessary to keep it away from fire. There must therefore be no smoking or carrying around of lights when fumigation is being done, nor should any electric current for light or fans be present, as the spark will ignite the vapor and cause an explosion. With these precautions anyone can use the liquid and obtain success.

The small farmer can construct his small fumigating box or if he has a good tight wine barrel he can use that. The larger producer can build a permanent structure of concrete which is by far the best, or if not out of T. and G. lumber, the walls, floor and roof made double with building paper between. The door should have beveled edges and should match well into the frame.

Bisulphide of carbon is a colorless liquid with a very offensive odor, locally known as "highlife" and is very volatile. When applying it for fumigating of stored grains or other materials it is used at the rate of one pound to 1000 cubic feet. The liquid should be poured into shallow pans, as the quicker it evaporates the better the results will be from the vapor. The pans should be placed on top of the grain to be fumigated, as the vapor being heavier than air will descend to the bottom of the room and gradually rise and fill the compartment. All material should be left in the fumigating room or box for at least 24 hours or, better, 48 hours. The vapor is very penetrating but when the grain, beans, corn and other foodstuffs are in bags a longer time is necessary to allow the vapor to reach every space. The bags should be carefully piled, especially when a large quantity is to be fumigated. Care should be taken to allow plenty of air space between them so that the vapor can readily reach each bag. When milled grain, like flour, middlings and other products have to be fumigated, owing to the density of these products, double the quantity of carbon-bisulphide should be used.

Summary.

It is absolutely necessary to have a tight box, barrel or room for fumigation.

If grain is in bags, the bags should be so placed as to allow free access of the vapor of carbon-bisulphide to all parts as near as possible.

Shallow pans should be used for the liquid and should be placed at the top of the pile to be fumigated.

From one to two pounds of carbon-bisulphide should be used for every 1000 cubic feet according to the density of the product to be fumigated, and should be subjected to the vapor for at least 24 hours, longer if possible.

As the liquid is very volatile and extremely explosive care should be taken not to allow any light or smoking around the building where the carbon-bisulphide is used.

Carbon-bisulphide can be purchased at any drug company and in any quantity. For small fumigations one gallon cans are handy. If larger quantities are kept on hand care should be taken to keep the container tightly corked to prevent evaporation. Cover corks or openings with paraffin wax.

Protecting Wild Life

NEW RULE OF THE DIVISION OF FORESTRY FOR BIRD, ANIMAL AND VEGETABLE LIFE PROTEC- TION ON CERTAIN SMALL ISLANDS.

The Board at its meeting on July 20, 1917, passed Rule IV of the Division of Forestry, which received the approval of the Governor on July 28, and which appeared in the By Authority page of the last issue.

The initial steps in this direction were taken during the 1917 session of the Legislature, when Representative Gerrit P. Wilder introduced a concurrent resolution for the protection of the birds on these small islands. This was afterward changed in the Senate to a bill and passed as Act 214, which gives authority to this Board to pass and enforce this rule.

The report of the Superintendent of Forestry recommending the adoption of Rule IV is as follows:

Honolulu, July 5, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—Act 214 of the 1917 session of the Legislature authorizes this Board to promulgate rules and regulations for the protection of bird, animal and vegetable life on six small islands off the windward coast of Oahu and one island, Mokuhoniki, off the eastern end of Molokai, and prescribes that the violation of any such rules and regulations shall be subject to the usual penalty of not to exceed \$500.

Rule IV of the Division of Forestry has therefore been prepared to comply with the provisions of this act, and is herewith presented for your approval.

It is my plan to have suitable signs painted in the English, Hawaiian and Japanese language posted on these islands as the initial step in enforcing Rule IV.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

Hog Embargo Removed

REPEAL OF RULE VII, DIVISION OF ANIMAL INDUSTRY, RELATING TO THE SHIPMENT OF HOGS FROM OAHU.

At the meeting of the Board held on June 20, 1917, it was voted to repeal Rule VII of the Division of Animal Industry, which prohibited the shipment of hogs from Oahu to the other islands in the group. Rule VII was passed in 1913 at a time when hog cholera was prevalent on Oahu and it was necessary to prevent the spread of the disease to the other islands.

In the following report on the matter the Territorial Veterinarian points out the reason for no longer continuing this prohibition. The notice of repeal of Rule VII was approved by the Governor on July 28, 1917, and appeared in the *By Authority* page of the last issue:

Honolulu, July 19, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—With reference to Rule VII of the Division of Animal Industry, prohibiting the shipment, transfer or exchange of hogs from the Island of Oahu to any other island of the Territory of Hawaii, it is recommended that said rule be repealed.

No case of hog cholera has come to the notice of this office for more than a year, and the disease known as swine plague, while still occurring now and then, is no more prevalent on Oahu than on any of the other islands. Under these circumstances Rule VII acts as a hindrance to trade only, and its usefulness has come to an end.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

Fiscal Year Transactions

REPORT OF THE BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY FOR THE FISCAL YEAR ENDED JUNE 30, 1917.

Changes in the organization of this Board, which looks out for the auxiliary interests of pure agriculture in the Territory, made effective by the 1917 session of the Legislature, resulted in the transfer on March 23, 1917, of the Division of Hydrography to the Commissioner of Public Lands, to whose work hydrographic activities are now more closely related, and provided for the taking over by this Board of the Territorial Marketing Division on July 1, 1917, and on the same date for the separation, in the interests of efficiency, of the old Division of Entomology into a Division of Plant Inspection to care for plant quarantine and inspection to prevent injurious insects from entering the Territory and a Division of Entomology to care for the work of beneficial insect introduction, propagation and distribution, suppressing injurious insects already here, and other general entomological work. The Board, as reorganized, now consists of five divisions—Forestry, Plant Inspection, Entomology, Animal Industry, and Marketing, all of which are supported by specific appropriation out of the general revenues.

Forestry.

The increasing value of water in these Islands, not only for the irrigation of agricultural fields, but also to meet the domestic needs of a growing population, has already justified the activities of the Division of Forestry during the past fourteen years in the effort to conserve and increase the sources of water supply by forest protection and extension. The division has, therefore, had this same object in view during the past year and in seeking to accomplish it has emphasized the work of fence building to keep stock from the native forests, the expansion of the field protective organization, the inclusion of additional forest areas in the reserve system, and the extension of the forests by actual tree planting.

During the fiscal year just ended 11.43 miles of new fences were constructed on forest reserve boundaries in Lualualei, Palolo, Makiki and Manoa valleys on Oahu and at the Olaa Forest Park and Upper Olaa reserves and at Kawaihae on Hawaii. Stretches of fences in Nuuanu, Oahu, and at Piha, Hawaii, amounting to 2.12 miles, were also repaired, making a total of over thirteen and a half miles of boundary effectively guarded against damaging stock.

One new forest ranger was appointed during the year and was assigned to Maui. The present force of six rangers on the four

main islands is sufficient to handle the routine work of forest protection combined with tree-planting work. They operate under Rule II of this division, which was passed in April, 1916, and which satisfactorily provides for the efficient preservation and administration of the forest reserves.

The only forest fire which occurred during the year was on the Military Reservation at Waianae-uka, on the Koolau range, where on June 25, 1917, about 50 acres of grass land with some patches of forest were burned over. This fire was promptly extinguished the same day by two troops of cavalry and 90 prisoners of war.

Two new forest reserves were set apart by official proclamation during the year, the Round Top Reserve, consisting of 115 acres of government land back of Honolulu, Oahu, adjacent to the existing Honolulu Watershed Forest Reserve, and the Panaewa Forest Reserve, consisting of 1750 acres of government land, in Waiakea, Hawaii, four miles out of Hilo and along the road leading to the volcano of Kilauea. This brings the total number of forest reserves in the Territory up to 40, with a total acreage of 800,094 acres.

The planting of trees in the Territory has continued on an increased scale, for the people are alive to the fact that water-producing mountains and waste land should properly be devoted to this purpose. During the past calendar year 660,079 trees were raised and distributed from the government nurseries for general planting throughout the Islands, and during this same period 925,400 trees were planted by both the government and private parties. Of this number 43 per cent was planted for water conservation, 35 per cent for fuel, 16 per cent for wind-break and 6 per cent for timber and ornament. The tree-planting activity of this division has been centered on water-producing areas back of Honolulu, on Oahu, and on two similar areas on Kauai. Considerable progress has also been made in the introduction and establishment of trees from other tropical countries, such as Australia and India, which will be suitable for the purposes of watershed cover and for timber production. An intensive experiment to determine the growing qualities and value of many introduced species has been started at the Manoa Ranger Station, where 50 different kinds of trees have been planted in varying amounts. On Arbor Day 20,979 trees were distributed for general planting throughout the Territory.

Entomology.

The work performed by the Chief Plant Inspector and his assistants during the fiscal year ended June 30, 1917, consisted of the inspection of all fruits, vegetables and plants coming into the Territory from foreign countries and the mainland of the United States, to prevent the introduction of pests and plant diseases liable to become injurious to the various agricultural industries

of these Islands, and the inspection of all fruits, vegetables and plants going from the port of Honolulu to the ports of all the other islands for the purpose of preventing the spread of any pest now existing on Oahu, as well as any future introduction of pests or fungi from Honolulu, the only port of entry for plants and plant products from foreign countries.

During this period there arrived at the ports of Honolulu, Hilo and Kahului, the only ports in the Territory where shipments of fruits and vegetables can enter directly and at which places local inspectors are stationed, 714 vessels. Of these, 331 carried vegetable matter, consisting of 316,052 packages of fruits and vegetables and 8233 packages of plants and seeds. Of this amount 6917 packages had to be fumigated on account of infestations of various kinds, 811 packages were destroyed by burning on account of either serious infestations or of being contraband, and 107 packages were returned to the original shipper as contraband and unmailable.

Many vessels also came to Honolulu for coal and other supplies on their way to the Orient, passing from the Atlantic to the Pacific through the Panama Canal. All these vessels were boarded and inspected for vegetable matter, so that no infested material on board should escape and be the cause of new pest introduction while the vessels were in port. Notices pertaining to fruit and plant shipments are served to the proper officers, who are then prepared on their future visits to comply with the rules and regulations of the territorial as well as the federal plant inspection.

The local consumption of fruits and vegetables imported from the Pacific coast is increasing with our growing population, and of late years, owing to the thorough system of county inspection, all fruits and vegetables are of better quality. The following were some of the larger staples imported:

Oranges	23,528 boxes
Lemons	5,523 boxes
Cabbage	1,113 crates
Celery	2,262 crates
Onions	22,798 bags
Potatoes	85,586 bags

During the past year large quantities of onions and potatoes have been produced on these Islands, both of excellent quality, showing that in time some importations at least could be reduced.

The inspection of horticultural produce leaving Honolulu for ports on the other islands has been continued on similar lines as last year. During the fiscal period 754 steamers were attended to and 10,967 packages of plants, fruits and vegetables were inspected. Of this number 187 packages were seized and refused shipment on account of infestation or of having undesirable soil

attached to the roots of plants which was liable to carry pests or diseases.

The new quarters which will soon be completed for the Division of Plant Inspection near the waterfront in Honolulu will greatly facilitate and increase the efficiency of plant quarantine and inspection.

The remainder of entomological work carried on during the past year, by a staff composed of one entomologist and two laboratory assistants, has consisted of introducing and propagating beneficial insects, advising in regard to agricultural and stock pests, and the care and upkeep of the insect collections.

During the year just passed two important parasitic insects have been introduced and established, one a small wasp-like insect living at the expense of the melon fly, a serious pest of fruit and vegetable gardens, the other a minute hymenopterous insect developing in and destroying the egg of the corn leaf hopper, the worst pest of Indian corn in the Islands. These two insects have been propagated in large numbers and distributed throughout the Islands, and it is believed that great benefit has been derived from them. The corn crop, which is of such importance at the present time, has been much better this year than in any previous year. Meanwhile the propagating of the parasitic insects introduced to control the ravages of the fruit fly and to keep down the number of dung flies has been continued, and it is believed these destructive and annoying pests are in some measure controlled.

No new lines of work have been undertaken on account of the difficulties of work in foreign countries during the continuance of the war, but the force and equipment is in the best condition possible to handle any beneficial introductions, and there are still opportunities to improve the conditions surrounding agriculture and stock raising by the methods which have been followed in the past.

The insect collections for reference and study have been overhauled and large accessions have been made to them, notably through gifts of Commissioner W. M. Giffard, and the miscellaneous collections of field workers. During the year, among other things, a study has been made of the native bees of the genus species *Prosopis*.

Animal Industry.

During the past year there has been a steady progress in the development of practically every class of domestic animal here without the interruption or setback of drouth or, with one exception, of disease. The rigid inspection made by this Division of all imported animals has been successful in keeping out of the Territory such diseases as rabies, foot and mouth disease and Texas fever which are proving such a scourge elsewhere. The imports of beef and dairy cattle have been represented by individuals of superior merit and the beneficial effect of pure-bred

bulls on the beef production is now an established fact with the result that the Territory is self-supporting so far as beef is concerned. The same may be said of hog meat, for the importation of swine was confined to pure-bred stock for breeding purposes and no hog cholera occurred during the year in island piggeries. Although the importation of mules for plantation use has continued at about the same rate, the number of horses imported has been less, due to the fact that the Army is buying island-bred horses in increasing numbers for cavalry remounts. Merino rams from New Zealand and America have been imported to improve the breeds on various ranches where sheep raising is profitable. Poultry and dairy products are still imported in increasing amounts to supply market demands. The improvement of all classes of live stock in the Territory has been accelerated by the opportunity of friendly competition offered by the county fairs held during the year on Hawaii and Maui.

The Division has successfully introduced and put to effective use a cure for sore-head in poultry, which has been the means of saving many flocks from extermination. Unfortunately this increase in poultry flocks has been somewhat offset by the unprecedented high cost of chicken feed.

The campaign for the eradication of bovine tuberculosis in the Territory has progressed with satisfactory results and the number of animals reacting to the test has been reduced to 2.87 per cent. In the 18 new dairies started during the calendar year 1916 all the animals were found to be free from tuberculosis. The passage of an act by the last legislature, whereby \$20,000 was made available for the indemnification of owners of cattle destroyed on account of tuberculosis, will doubtless greatly aid the Division in the complete eradication of this disease.

The only serious outbreak of an animal disease during the year was the sudden appearance of anthrax in April on a large ranch on the windward side of Kauai. This was followed late in May by an outbreak of the same disease in a dairy herd on the outskirts of Honolulu on Oahu, and early in June by outbreaks in several different pastures on the Island of Maui. As soon as the outbreak occurred quarantines were placed on each island and the infected districts were closely guarded to prevent the spread of the disease. Carcasses of animals dying of the disease were located as speedily as possible and cremated at once. Supplies of serum vaccine were cabled for and by its use the spread of the disease was greatly checked. Fortunately it was possible to secure from the legislature, still in session when the first outbreak occurred, a special appropriation of \$25,000 to combat the disease. The question of how anthrax reached the Territory, where it has never occurred before, remains an unsolved puzzle since it would be next to impossible for the disease to reach these shores by means of live animals because, when the infection once gains an entrance into the blood, the victim dies in the course of a few hours to two or three days. The

theory that it was brought in with imported grass seed is refuted by the appearance of the disease in pastures where no imported seed was ever planted. Another theory, that it may have been introduced with imported bone meal, has also failed of proof after exhaustive bacteriological experiments. In the meantime everything is being done to control the disease in infected districts and to prevent its spread to the Island of Hawaii.

Division of Forestry

Honolulu, Hawaii, September 5, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of August, 1917:

Forest Fires.

Owing to the continued dry weather the danger of grass and forest fires has increased and fire warning notices have been posted by the District Fire Wardens and Rangers to remind the people of the necessity of being careful with the use of fire. On Oahu two small grass fires have occurred lately in the vicinity of Maili ridge near Schofield Barracks, but have been promptly extinguished by the army.

On Hawaii the homesteaders on the land of Laupahoehoe have been clearing land for cane and several times the forest has been threatened by fires which have escaped. This prompted Mr. R. A. Hutchinson, manager of the Laupahoehoe Sugar Company, through Theo. H. Davies and Company to recommend the appointment of Mr. H. S. Rickard of Laupahoehoe as an Assistant District Fire Warden to keep a special watch to prevent the starting of forest fires in this region. To relieve the situation, the President accordingly on August 24 issued such a commission, confirmation of which is hereby respectfully recommended.

Forest Planting.

The work on government lands in the forest reserve in upper Manoa Valley consisted mainly in clearing around the koa trees where weeds and grass had grown up. In addition to this 400 koa trees were planted out during the month. Several hundred willow slips have been sent up Manoa for planting in a swampy area near the forest boundary.

Entomologist D. T. Fullaway kindly visited the planted trees with me one day to inquire into the cause of the damage that was noticed had been done to quite a number of the young koa trees. It was found that soon after planting out the main stem would be severed by a clean cut several inches above the ground. A careful examination failed to show that the injury was caused

by any insect and we reached the conclusion that it could most probably be ascribed to mice which cut the stems in search of food. The damage fortunately is not serious since the plant recovers rapidly by sending up a side shoot for the leader.

On August 23 the Forest Nurseryman and myself, assisted by the tree planters, set out and properly tagged on the Manoa Ranger Station three young plants each of 39 different species of Australian trees, the seeds of which had been kindly furnished by Mrs. C. C. Kennedy. Among these are many new species which will be tested out here for growth to determine whether they are suitable for general planting in the Territory.

By the "Makura" on August 21 two boxes of plants and young trees were received from Mr. E. Mitchelson of Auckland, New Zealand. This gentleman had recently been in Honolulu and in return for seeds and plants that had been furnished him kindly sent these in return. Among the shipments are 25 Kauri pines and several other valuable timber trees which should do very well in these Islands.

Hauula Forest Reserve.

Several days were spent on the proposed Hauula Forest Reserve where the homesteaders on August 6 began the construction of a fence on the revised boundary to keep cattle from getting into the native forest. Forest reserve monuments were also placed on conspicuous points along the line. Recommendations for setting apart this government forest land as a reserve will soon be presented.

Miscellaneous.

A visit was made to the Island of Kapapa in Kaneohe Bay which is included among the islands covered by Rule IV for the protection of bird, animal and vegetable life. It was ascertained from local fishermen and by inspection that the island, which is only about three acres in extent, is not a continuous nesting place for native birds, but that it is visited at certain seasons of the year only by migratory birds.

Examinations were made into several proposed land exchanges on Tantalus and into additional areas in need of forest planting.

Forest Ranger Hosea K. Lovell began his duties on August as Ranger for the Island of Kauai.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, August 31, 1917.

Superintendent of Forestry, Honolulu, T. H.

Dear Sir:—The following is a report of the principal work done during the month of August:

Nursery—Distribution of Plants.

	Transplants In Boxes	Pot Grown	Total
Sold	200	110	310
Gratis	650	382	1032
	850	492	1342

Collections.

Collections on account of plants sold	\$ 4.30
Rent of office building, Nursery Grounds (June)	35.00
Total	\$39.30

Plantation Companies and Other Corporations.

The distribution of plants during the month amounted to 28,000 seedlings.

Judging from the number of orders already coming in for trees there will be a great deal of planting done during the coming rainy season.

Makiki Station.

The work at this station has been principally routine, namely, potting and transplanting trees, mixing and sterilizing soil, etc.

Honolulu Watershed Planting.

We are now planting trees in the main Makiki Valley. The bare spaces around the spring heads are all being planted, also the bare slopes lower down. 1315 koa trees have been planted during the month.

Advice and Assistance.

The following number of requests were made during the month for advice and assistance:

Visits made	8
Advice by letter.....	4
Advice by telephone.....	6
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Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

Division of Entomology

Honolulu, Hawaii, August 31, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—During the month of August the insectary handled 2,400 pupae of the melon fly, from which emerged 599 females and 510 males *Opium fletcheri*.

The distribution of parasites was as follows:

Opium fletcheri.

	Females	Males
Oahu—		
Fort Ruger	75	50
Sheridan Street	285	215
Kauai—		
Kealia	75	50

Galesus.

Oahu—		
Kalihi	20	25

Chalcid.

Oahu—		
Kalihi		300

Tetrastichus.

Oahu—		
Kalihi		400

Paranagrus (Corn leaf hopper parasite).
Oahu—

Makiki Nursery	1350
Young Street	1150
Kauai—	
Kapaa	1150
Respectfully submitted,	
DAVID FULLAWAY,	
Entomologist.	

Division of Plant Inspection

Honolulu, Hawaii, August 31, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of August, 1917, as follows:

During the month there arrived at the port of Honolulu 54 vessels, of which 23 carried vegetable matter and one vessel brought moulding sand. Two vessels passed through the Canal Zone in transit to the Orient.

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed as free from pests.....	1,508	29,991
Fumigated	18	367
Burned	53	56
Returned	1	2
<hr/>		
Total.....	1,580	30,416

Of these shipments 29,971 packages arrived as freight, 360 packages as baggage of passengers and immigrants and 85 packages as mail matter.

Rice and Bean Shipments.

During the month 71,926 bags of rice and 6,211 bags of beans arrived from Japan and oriental ports. Of these, one lot of 40 bags was found infested with the rice weevil and the larvae of a meal beetle *Tenebroides mauritanica* and was fumigated with carbon bisulphide for 48 hours. All the rest was passed as free from pests. I have again given warning to the shippers of rice and to the agents of the steamship company drawing attention to Rule III, which requires that all rice shall be fumigated at the ports of embarkation in Japan.

Pests Intercepted.

Approximately 5,496 pieces of foreign baggage belonging to passengers and immigrants from foreign countries were examined and from the same were seized and destroyed by burning 40 packages of fruit and 9 packages of vegetables.

On August 2, a package of tree seeds by mail from India for J. F. Rock was fumigated as a precaution.

Two packages of Algaroba seed pods by mail from France were returned as unmailable.

On August 6, per S. S. Korea Maru, in the baggage were found the following:

2 packages of Chrysanthemum plants, found infested with larvae of Depidopteron were burned.

1 crate of vegetables containing a nest of ants, *Prenolepis longicornis*, burned.

1 package of bulbs fumigated as a precaution.

1 miniature garden, soil removed and passed.

On August 7, per S. S. Columbia from Manila:

2 cases of orchids, fumigated as some of the packing showed evidences of larvae and pupae of a Tineid moth.

On August 9, per S. S. Manoa from San Francisco:

1 box of peaches, infested with the peach moth, destroyed by fire.

On August 14, per S. S. Matsonia from San Francisco:

1 box ornamental plants, all soil removed and plants fumigated on account of *Aphis*.

On August 17, per S. S. Siberia Maru from Japan:

1 ornamental plant in baggage burned on account of infestation.

On August 21, per S. S. Makura from Australia:

2 boxes of forest trees for our Board. All soil was removed and one box fumigated on account of Psyllid infestation; the leaves of the infested plants were removed and destroyed.

On August 28, per S. S. Kestrel from Fanning Island:

The crew had 150 coconuts which showed slight infestation of scale and which were fumigated before they were landed.

On August 30, per S. S. Tenyo Maru from Japan:

A Juniper tree and a Wistaria plant were found in the baggage and were fumigated and the soil removed.

A passenger had 9 ornamental plants which he was taking to Canada. These, apparently free from pests, were held in quarantine by us until he continued his journey.

By freight our Board received 2 large bags of palm seeds from Manila which were fumigated as a precaution.

One basket of beneficial insects came for the H. S. P. A., and was examined by Mr. Swezey and myself, and all the soil and packing was burned.

Hilo Inspection.

Brother M. Newell reports the arrival of two steamers which carried vegetable matter consisting of 163 lots and 2054 packages, which, being free from pests, were passed for delivery. During the month the Kiyo Maru arrived direct from Japan and brought 3,474 bags of rice, 236 bags of beans, 11 bags of sesame seed and 9 packages of vegetable seeds. Two hundred and twenty bags of rice were infested with the rice moth and were rushed to the mill and run through the cleaner.

Kahului Inspection.

On August 20, Mr. Will J. Cooper was granted permission to leave for the Officers Training Camp, and Mr. E. C. Moore of Haiku will act as a substitute during his absence.

During the month two vessels arrived at the port of Kahului, which brought vegetable matter consisting of 95 lots and 583 packages of fruits and vegetables. Four boxes of turnips were again condemned on account of being infested with the radish maggot, and ordered dumped at sea.

Inter-Island Inspection.

Fifty-nine steamers plying between Honolulu and other island ports were attended to, and the following shipments were passed as free from pests:

Taro	501	bags
Plants	242	packages
Vegetables	213	packages
Fruit	20	packages
<hr/>		
Total.	976	packages

Three packages of plants and three packages of fruits were seized and refused shipment on account of infestation and undesirable soil.

Respectfully submitted,

E. M. EHRHORN,
Chief, Division of Plant Inspection.

Division of Animal Industry

Honolulu, Hawaii, September 6, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—I beg to submit the following report for the month of August, 1917:

Tuberculosis Control.

The following dairy cattle were tested during the past month:

Tested. Passed. Condemned.

Castle Home	4	4	0
-------------------	---	---	---

Anthrax Situation in Honolulu.

Since the removal of the Farm animals to the special quarantine station on the Ala Moana Road, no deaths have occurred among them from anthrax. In fact they can no longer be considered as anthrax animals and by the end of this month or as soon after as practicable the quarantine will be raised and the animals turned over to Mr. Farm to dispose of them as he sees fit. They are now no longer a source of danger to the public and the milk from these animals is as fit for human consumption as before the outbreak.

Anthrax Situation on Kauai.

The situation on Kauai is steadily improving, in fact we may consider the outbreak at an end. During the month 1 horse, 1 colt, 1 mule, 4 cows, 1 heifer and 2 calves have died of anthrax on the Hanalei Ranch, in all a total of 10 head. No deaths from anthrax have occurred on the ranch since the 24th of August which would seem to indicate that the outbreak has exhausted itself.

The revaccination of the ranch herd is now complete, Dr. Golding having vaccinated a total of 700 head this past month. Another vaccination will be made at the next drive some time in January, 1918.

The situation at Niumalu has so far improved that the quarantine was raised on August 31st, and that particular outbreak may be considered at an end.

Sore-head in Chickens.

During the past month 1000 cc. of chicken-pox vaccine was made up and distributed among the poultry raisers of this island.

Importations of Live-stock.

S. S. Maui, San Francisco: 4 cts. poultry, A. J. Campbell.

S. S. Korea, Yokohama: 10 cts. pheasants, E. H. Paris.

S. S. Manoa, San Francisco: 67 cts. poultry.

S. S. Matsonia, San Francisco: 1 ct. pigeons, W. F. X. Company; 1 ct. chickens, 1 dog, James Lynch; 1 dog, T. V. King; 1 ct. poultry, Mrs. Orth.

S. S. Wilhelmina, San Francisco: 9 cts. poultry, 1 dog, W. F. X. Company.

S. S. Maui, San Francisco: 2 cts. sea gulls, 1 ct. crabs, 1 ct. ducks, 1 tank fish, Wm. Wise; 1 ct. chickens, E. H. Moses, Hilo; 1 cat, Mrs. H. B. Giffard; 1 cage birds, Mrs. H. B. Giffard; 1 dog, John Mellen.

S. S. Lurline, San Francisco: 12 Holstein cows, C. W. Lucas; 1 Holstein bull, W. E. Bellina; 12 mules, H. Hackfeld & Company; 1 horse, Q. M. Department; 1 horse, Gen. Wisser.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

Marketing Division

Honolulu, T. H., September 17, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—I respectfully submit the following report of the Marketing Division for the month of August, 1917:

During the month, the Division has handled 194 consignments, of 30 different kinds of produce, from 91 consignors. The consignors are located on the Island as follows: Oahu, 49; Hawaii, 14; Maui, 12; Molokai, 12; Kauai, 4. Among the goods received were dressed beef, veal and pork, live cattle and hogs, Irish and sweet potatoes, dried beans, corn, grapes, bananas, onions, poultry, eggs, pohas, cabbage and watermelons.

The consignment sales for the month amounting to \$11,468.15 are \$1,884.68 less than the month of July, but this is to be expected as during the months of July, August and September there is not much produce to be marketed.

Our retail vegetable department made a profit of \$122.32 during the month, but the butcher department lost \$100.91. We have raised the prices of meats in this department in an effort to put this end of the business on a profitable basis. This leaves us a profit of \$21.41 in our retail departments, and a profit of \$716.63 on consigned merchandise, leaving a net profit of \$738.04.

I enclose herewith, a statement of operations for the month and a copy of the general ledger trial balance.

Respectfully submitted,

O. B. LIGHTFOOT,
Acting Superintendent.

SEGREGATION OF PRODUCE RECEIVED BY THE MARKETING
DIVISION DURING THE MONTH OF AUGUST, 1917.

Articles—	Total	Oahu	Hawaii	Maui	Molo- kai	Kauai
Avacados.....	477	60	417	....	....	....
Bananas, bunches.....	554	554	....	....	....	....
Beans, string, lbs.....	478	478	....	....	....	....
Beans and Peas, dry, sacks.....	101	....	4	90	7	....
Beans, wax, lbs.....	23	23	....	....	....	....
Beef, dressed, head.....	147	8	19	79	11	30
Cabbage, lbs.....	1,434	1,434	....	....	....	....
Chickens.....	201	74	24	52	51	....
Corn, dry, sacks.....	131	....	....	131	....	....
Ducks.....	87	61	11	6	9	....
Eggs, chicken, dozen.....	172	122	....	....	50	....
Eggs, duck, dozen.....	5	5	....	....	....	....
Grapes, lbs.....	3,256	....	3,256	....	....	....
Hides.....	11	7	1	1	2	....
Hogs, dressed.....	23	6	13	4	....	....
Honey, gals.....	2	2	....	....	....	....
Limes.....	1,611	200	....	....	1,216	200
Onions, sacks.....	55	33	....	22	....	....
Papaias, lbs.....	2,672	2,672	....	....	....	....
Peppers, lbs.....	55	23	....	....	....	....
Pohas, lbs.....	895	....	895	....	....	....
Potatoes, Island Irish, sacks.....	109	14	60	....	....	35
Potatoes, sweet, sacks.....	120	98	....	....	6	16
Potatoes, red sweets, sacks.....	65	65	....	....	....	....
Rice, sacks.....	5	5	....	....	....	....
Rabbits, live.....	6	6	....	....	....	....
Turkeys.....	2	....	2	....	....	....
Tallow, lbs.....	111	111	....	....	....	....
Tomatoes, lbs.....	23	....	23	....	....	....
Veal, dressed, head.....	20	13	2	....	5	....

TERRITORIAL MARKETING DIVISION.

GENERAL LEDGER TRIAL BALANCE, AUGUST 31, 1917.

Furniture and Fixtures.....	\$ 3,224.42
Automobile	1,286.50
Motorcycle	60.00
Pineapple Crates	2,863.89
Butcher Department	645.92
Retail Department	223.02
Seed Account	941.84
Bank of Hawaii, Ltd.....	1,184.51
Petty Cash	250.00
Accounts Receivable	8,782.59
Longley & Westgate.....	3,000.00
Consignors' Accounts	\$ 3,675.20
Vouchers Payable	428.80
Note, Bank of Hawaii.....	2,500.00
Revolving Fund, 1915-1917.....	5,194.53
Reserve for Doubtful Accounts.....	2,414.29
Seed Appropriation No. 190.....	1,839.31
" " " 206A	500.00
" " " 206B	2,192.95
" " " 206C	360.00
Revolving Fund, 1917-1919.....	5,588.13

Surplus	851.64
Consignment Expense	268.83
Departmental Expense	501.08
Cost of Merchandise	8,462.45
General Expense	3,072.55
Butcher Sales	5,915.47
Retail Sales	3,066.20
T. Pearson & Co.	108.05
Hold Account	116.39
Commissions	1,189.64
Cash not deposited 7/31/17	1,189.64
" " " " 8/31/17	288.24
	<hr/>
	36,093.04
	<hr/>
	\$36,093.04

The Hawaiian Taro as Food

By VAUGHAN MACCAUGHEY,
Professor of Botany, College of Hawaii, Honolulu.

The most important and distinctive crop-plant of the native Hawaiian is the *taro* or *kalo*. This valuable aroid (*Colocasia antiquorum* var. *esculenta*) occurs in many parts of the South Pacific, and in tropical Asia, and was brought to Hawaii by the early Polynesian migrants from the south. They were skilful and industrious farmers, and developed their primitive agriculture to a high state of efficiency.*

The taro plant resembles in appearance the large caladiums or "elephant's ears" common in eastern lawns and gardens. From the large, starchy, subterranean corm, (which is the part of economic value), springs a cluster of large, sagittate leaves. The corm is usually 6-12 inches long and 4 or 5 inches in diameter, like a large sweet potato. The petioles rise to a height of 2-4 feet; the blades are 10-16 inches long and 8-12 inches broad; they are bright yellow-green and so smooth that water runs off them like quicksilver. The flowers are of the typical aroid pattern, with spadix and creamy-yellow spathe, 3-5 inches high; flowers are rare and seed production is practically unknown. Taro has been propagated for untold centuries by purely vegetative methods and like many other tropical plants, (sugar cane, sweet potatoes, pineapples, bananas, etc.), has lost the seed habit.

A widely-circulated misstatement concerning Hawaiian taro is to the effect that "there are about forty varieties." In 1913 the writer, with the invaluable assistance of Mr. Joseph S. Emerson (deeply versed in the Hawaiian language and lore), made a careful survey of the native varieties and their names.† We col-

* See Agriculture in Hawaii, V. MacCaughey, Paradise of the Pacific Magazine, Dec., 1911, pp. 19-24.

† See The Kalo in Hawaii, by Vaughan MacCaughey and J. S. Emerson, published in the Hawaiian Forester in 10 installments, vols. 10 & 11, 100 pages and 20 illustrations.

lected over 300 distinct varietal names, in use among the natives. A certain proportion of these were synonyms and variants. After making all due allowances and examining the native taros themselves in hundreds of plantings, we arrived at the mature conclusion that the primitive Hawaiians cultivated and habitually recognized over 200 distinct varieties and strains of taro. Much of the old culture has been wholly abandoned, and many of the varieties today are very localized, or on the verge of extinction.

Some of the more important and representative varieties are indicated in the following list: *Aha-kea, Apī'i, Apū-wai, Aweo-woo, Lulu, Ha'e-ha'e, Ha'o-kea, Ka'i, Ko'a'e, Kumu, Lau-loa, Lehua, Lola, Mana, Manini, Naio, Owene, Palai'i, Pi'i-ali'i, Piko, Poni, Uahi-a-Pele, Uluma'u, Welo-welo-la*. The choicer kinds were raised exclusively for the chiefs and nobility (*alii*) and were often spoken of as "royal taro." Other kinds were reserved for medicinal use, and for religious incantations and ceremonies.

From the standpoint of cultivation the Hawaiian taros may be conveniently classed in four groups:

1. Those raised only in upland, dryland, or unirrigated regions, *kula*.
2. Those raised only in wetlands, lowlands, or irrigated areas, *loi*.
3. Those raised both in wetlands and drylands, *loi* and *kula*.
4. Wild taros, growing in damp places and swamps in or near the forests.

The islands of Hawaii and Maui were famous in the early days for the excellence of their upland taros, whereas the islands of Oahu and Kauai, with extensive coastal plains, were devoted chiefly to the lowland kinds. Great skill was shown by the primitive Hawaiians in diverting water from the mountain streams, leading it through ditches down to the taro lands, and spreading it over the valley floors and lowlands, where the innumerable tiny patches, each surrounded by an embankment, were arranged in a veritable patchwork of low terraces.

Taro requires about one year for maturity. The corms are dug, the roots and leafy tops removed, and the corms washed. They are then thoroughly steam-cooked in a native underground oven (*imu*); this requires several hours. The cooked corms are peeled and pounded into a soft, pasty mass. The pounding is done in a long wooden trough or "poi-board," by means of stone pestles. It is a laborious process, done by the men; often two men work at opposite ends of the same board. The finished product is almost pure starch, and is called *paiai* or "hard poi." To this suitable quantities of water are added, as required, and it is thoroughly mixed. The resultant thick paste is the famous *poi* of Hawaii and the South Seas. It is a staple food in the dietary of the natives.* It ferments slightly and will keep a

* See The Food Plants of the Ancient Hawaiians, Vaughan MacCaughey, The Scientific Monthly, 4:75-80, Jan., 1917.

long time without spoiling. The natives store it in wooden bowls (*umeke*) and eat it with the fingers. Large quantities are consumed at a single meal. "Fish and *poi*" is a phrase among the natives equivalent to the American "square meal."

The succulent young leaves and petioles of the taro are cooked and eaten like spinach and comprise the delicate vegetable called *luau*. The general use of *luau* at native feasts has caused the feasts themselves to become known as *luaus*. The taro corm is also eaten as a baked or roasted vegetable, and is often mixed with breadfruit, coconut, sweet potatoes, and other foods. It is never eaten raw, because of the irritating raphides that are only dispelled by cooking.

Due to the unsanitary conditions under which hand-pounded *poi* is often made, many persons, especially Americans, prefer the machine-made *poi*. There are several factories in Honolulu; the process in brief is as follows: The corms are washed, boiled in large drums by means of live steam under pressure, and peeled by hand. The peeling is done by women, under sanitary conditions. The peeled corms are passed through a massive machine that resembles a huge meat-chopper set vertically. Water is added as needed, and the paiai, of uniform texture, comes out of the bottom of the grinder and is put into small barrels, ready for sale.

Experiments conducted at the College of Hawaii during the past year afford instructive corroboration of the well-known high food value of taro. Chemical analyses of the raw corms, conducted according to standard technique, gave the following results:

Starch	34.12%
Sugars	1.08%
Fats	1.06%
Proteins . . . . .	.72%
Ash . . . . .	.67%
Crude fiber . . . . .	.50%
Water	59.00%

Taro has a much lower moisture content than either Irish or sweet potatoes, its fat content is higher, its protein content is lower. As to starch, taro has more than double the amount possessed by Irish potatoes, and nearly 50% more than sweet potatoes.

The starch-grains of taro are *exceedingly minute* (1/25,000 to 3/25,000 in diameter), very much smaller than those of the common cereals, for example. For this reason taro and *poi* are easily digested, and are commonly recommended for invalids, infants, and aged persons. Taro flour or "taroena," manufactured from the dried, ground corm, has been in local markets for a number of years.

With the many and profound economic changes that have tak-

en place in the Hawaiian Islands during the past century, the taro has become of rapidly decreasing importance as a food plant. The natives have diminished until there is today but a vanishing remnant of a once splendid stock*. They are the chief consumers of taro and poi; the other nationalities now dominant—American, Japanese, Chinese, Portuguese, Spanish, Filipino, etc.—use relatively insignificant quantities. It is to be hoped that taro and its products will become more generally known to Americans, not only in Hawaii, but also on the mainland, especially in the Southern States. Its simple culture, its comparative freedom from insects and fungus pests, its high yields per acre, its excellent storage qualities, its varied uses, and its extraordinary nutritive values—all combine to make the Hawaiian taro a food-plant of much interest and of large economic possibilities. This is particularly true at the present time, when the attention of the nation is focussed upon the conservation of food, and the wheat shortage places special emphasis upon the starches.

* The Vanishing Hawaiian, Vaughan MacCaughey, Pearson's Magazine, 36:337-338, Oct., 1916.

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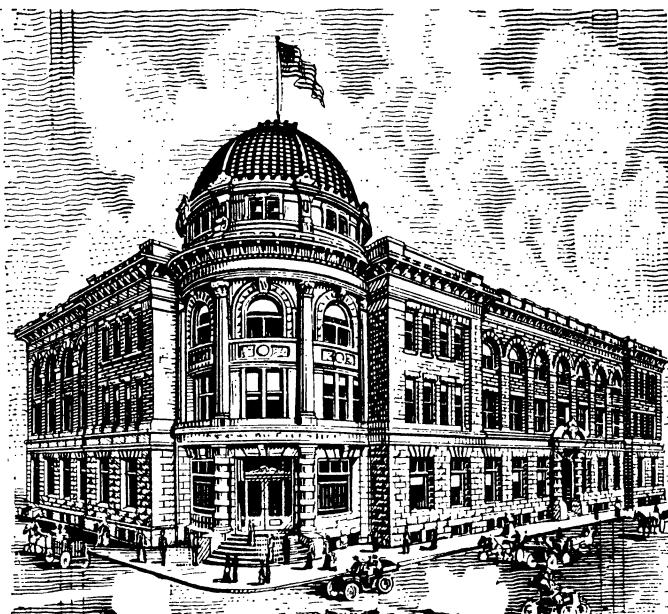
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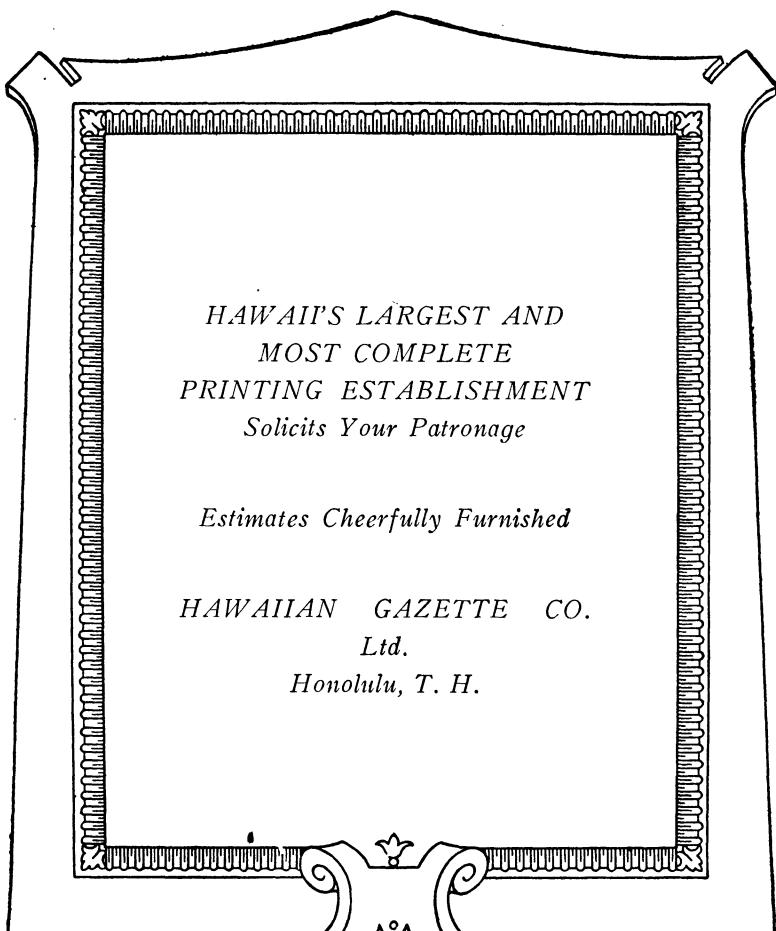
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